NOTES ON A COLLECTION OF LIZARDS FROM THE EUCLA SAND DUNES IN WESTERN AUSTRALIA

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ABSTRACT

A list of 14 lizard species found on the Eucla sand dunes during the summer of 1968 is presented, along with ecological data on four most abundant species *Ctenophorus maculatus dualis*, *Ctenophorus pictus*, *Ctenotus euclae*, and *Morethia obscura*. All four species prey predominantly on ants, but some also eat grasshoppers, hemipterans, insect larvae, and wasps. No females of any of these four species had enlarged eggs, but 3 of 5 *Tiliqua rugosa* were gravid. This lizard assemblage is compared to two others, one at a shrub desert site, and another at a pure spinifex desert area.

INTRODUCTION

During the summer of 1968 on February 2-3, with my very able field assistant H. L. Dunlap, I collected 110 lizard specimens of 14 species near the old Eucla ruins (approximate Lat. 31° 43' S. x Long. 128° 53' E.). These include agamids (5 species), skinks (5 species), and geckos (4 species). Specimens of the following 4 species were deposited in the Western Australian Museum (sample sizes in parentheses): *Ctenophorus maculatus dualis* (32), *Ctenotus euclae* (27), *Lerista dorsalis* (2) and *Lerista baynesi* (2). All others are housed in the Los Angeles County Museum of Natural History (LACMNH): *Ctenophorus pictus* (8, augmented with 9 specimens from nearby areas), *Amphibolurus norrisi* (1), *Pogona nullarbor* (3 juveniles), *Ctenophorus adelaidensis* (5), *Morethia obscura* (20), *Tiliqua rugosa* (5), *Strophurus intermedius* (1), *Diplodactylus calcicolus* (1), *Underwoodisaurus milii* (1), and *Gehyra variegata* (1). Taxonomy used here follows Wilson and Swan (2013).

METHODS

We recorded air and body temperatures, activity times, microhabitats, fresh snout-vent lengths (SVL), tail lengths, and weights for as many lizards as possible. Stomach contents were identified and prey volumes

estimated. Dietary niche breadth was calculated using the inverse of Simpson's (1949) index of diversity [$D = 1/ \Sigma p_i^2$] where p_i is the proportion by volume of prey in category *i*.

RESULTS

Habitat and Abundance. White sand dunes, vegetation consisted of saltbush, chenopods, scattered bushes and a few eucalypts. Four lizard species, two agamids and two skinks, were abundant. *Ctenophorus maculatus dualis* was most abundant. Less common, but still fairly abundant were *Ctenophorus pictus*. We also collected two species of skinks, *Morethia obscura* and *Ctenotus euclae*, a close relative of the desert dweller *Ctenotus brooksi*.

Microhabitat. Proportions of lizards first sighted in the open sun, in the sun near bushes, and in the shade near bushes, were as follows: *Ctenophorus maculatus dualis* (0.259, 0.537, 0.204), *Ctenophorus pictus* (0.667, 0.333, 0.0), *Ctenotus euclae* (0.39, 0.58, 022), and *Morethia obscura* (0.2, 0.775, 0.025).

Size and Sexual Dimorpism. The viviparous herbivorous skink *Tiliqua rugosa* is the largest species. Both common species of agamids were large and heavy compared to the smaller and much lighter two skink species (Table 1). Adult females are significantly larger than adult males in *Ctenotus euclae* (average SVL 49.73 ± 0.71 versus 45.59 ± 0.87, Ns = 13 and 11, respectively) and also in *Ctenophorus maculatus dualis* (average SVL 56.13 ± 0.729 versus 51.75 ± 0.477, Ns = 15 and 16, respectively). Two female *Ctenophorus pictus* were also appreciably larger than 4 males, but little size difference was detectable between sexes in *Morethia obscura*.

Thermal Relations. As in most diurnal desert lizards, active body temperatures are positively correlated with ambient air temperatures. Average air and body temperature of active lizards and times of activity are given in Table 2.

Diets. Stomach contents of two species of skinks and two agamids are summarized in Tables 3–6.

Table 1. Average snout-vent length, mm (SVL), average tail length, mm, mean body weight, grams, and sample sizes for 5 species (juveniles included)

Species	SVL	Tail	Weight	Ns
Ctenotus euclae	45.6	76	1.86	27,18,27
Ctenophorus maculatus dualis	52.9	114	5.25	32,31,32
Ctenophorus pictus	56.3	87.7	6.8	6,6,6
Morethia obscura	46.1	71.6	1.845	20,5,20
Ctenophorus adelaidensis	28.2	31	0.88	3,4,5

Table 2. Average ambient air temperature (AT), active body temperatures (BT), times of activity, and sample sizes for 5 species

Species	AT	BT	Time	Ns
Ctenotus euclae	24.2	33.37	1126	24,25,26
Ctenophorus maculatus dualis	25.0	37.5	1375	30,31,32
Ctenophorus pictus	23.2	32.37	1253	3,3,5
Morethia obscura	23.9	34.68	1220	15,18,19
Ctenophorus adelaidensis	24.5	35.05	1224	3,3,5

Table 3. Stomach contents of 27 *Ctenotus euclae* (Dietary Niche Breadth = 2.74).

Prey Type	Number	Volume	% Volume	Frequency
Spiders	5	0.06	3.39	4
Ants	202	0.91	51.41	21
Locustids	1	0.05	2.82	1
Thysanura	1	0.01	0.57	1
Beetles	2	0.03	1.69	2
Termites	2	0.01	0.57	1
Hemiptera	6	0.05	2.82	3
Larvae	22	0.55	31.07	13
Other Insects	2	0.04	2.26	2
Vertebrate	1	0.04	2.26	1
Vegetation	1	0.01	0.57	1
UnID	1	0.01	0.57	1
Totals	246	1.77	100	

Table 4. Stomach contents of 19 *Morethia obscura* (Dietary Niche Breadth = 4.2).

Prey Type	Number	Volume	% Volume	Frequency
Ticks	5	0.01	0.93	2
Spiders	6	0.07	6.54	6
Ants	69	0.42	39.25	16
Locustids	4	0.19	17.76	4
Beetles	5	0.06	5.61	4
Hemiptera	14	0.22	20.56	8
Larvae	3	0.04	3.74	3
UnID Isects	6	0.03	2.80	6
Vegetation	3	0.04	3.74	2
Totals	110	1.07	100.00	

Table 5. Stomach contents of 31 *Ctenophorus maculatus dualis* (one other stomach was empty) (Dietary Niche Breadth = 1.96).

Prey Category	Number	Volume	% Volume	Frequency
Ants	937	3.87	68.98	31
Wasps	31	0.95	16.93	17
Locustids	2	0.08	1.43	2
Thysanura	2	0.02	0.36	2
Beetles	1	0.02	0.36	1
Hemiptera	10	0.3	5.35	8
Diptera	5	0.22	3.92	5
Lepidoptera	1	0.01	0.18	1
Larvae	1	0.01	0.18	1
Vertebrate	1	0.1	1.78	1
Vegetation	2	0.03	0.53	2
UnID	1	0.001	0.01	1
Totals	994	5.611	100.01	

Table 6. Stomach contents of 17 *Ctenophorus pictus* (Dietary Niche Breadth = 1.62).

Prey Type	Number	Volume	% Volume	Frequency
Spiders	1	0.01	0.55	1
Ants	449	1.41	77.90	17
Locustids	1	0.01	0.55	2
Beetles	1	0.05	2.76	1
Homoptera	1	0.02	1.10	1
Hemiptera	5	0.15	8.29	3
Diptera	1	0.08	4.42	1
UnID Insects	2	0.06	3.32	2
UnID	3	0.02	1.11	1
Totals	464	1.81	100	

Ants are the most important prey items in all four species. *Ctenotus euclae* also consumes insect larvae and has a dietary niche breadth of 2.74. *Morethia obscura* also eats grasshoppers and hemipterans and has the broadest dietary niche breadth of 4.2. *Ctenophorus pictus* has the most specialized diet (niche breadth = 1.62). Like its desert relative *Ctenophorus isolepis* (Pianka 1971), *Ctenophorus maculatus dualis* is an ant specialist with a narrow dietary niche breadth of 1.96 (Table 5), but it also eats wasps. Two individuals had eaten small amounts of vegetative material. Dietary niche breadths of both skinks are greater than those of both agamids.

Table 7. Comparison of lizard assemblages at three sites.

Lizard Type	Eucla	Lake Yeo	Neale Junction
Short Legged Agamids	*Ctenophorus pictus*	*Ctenophorus nuchalis* *Ctenophorus reticulatus*	*Ctenophorus nuchalis*
Long legged Agamids	*Ctenophorus maculatus dualis*	*Ctenophorus isolepis* *Ctenophorus scutulatus*	*Ctenophorus isolepis*
Small Agamid	*Ctenophorus adelaidensis*		
Large Agamids	*Amphibolurus norrisi* *Pogona nullarbor*		
Large Monitor	*Varanus rosenbergi* (highly expected)	*Varanus gouldii*	*Varanus gouldii*
Small Monitor			*Varanus eremius*
Ctenotus skinks	*Ctenotus euclae*	*Ctenotus* (2 species)	*Ctenotus* (6 species)
Liopholis skinks		*Liopholis inornata*	*Liopholis* (2 species)
Small Skink	*Morethia obscura*		*Menetia greyi*
Large Skink	*Tiliqua rugosa*	*Eremiascincus richardsonii*	
Fossorial Skinks	*Lerista dorsalis* *Lerista baynesi*		
Small TerrestrialGeckos	*Diplodactylus calcicolus*	*Diplodactylus conspicillatus* *Heteronotia binoei* *Rhynchoedura ornata*	 *Heteronotia binoei* *Rhynchoedura ornata*
Arboreal Geckos	*Strophurus intermedius* *Gehyra variegata*	*Strophurus strophurus* *Gehyra variegata*	
Large Terrestrial Gecko	*Underwoodisaurus milii*	*Nephrurus vertebralis*	*Nephrurus levis*
Total Number of Species	14 (15)	15	16

Reproduction. Three female *T. rugosa* had large embryos in their oviducts, as follows:

Number	SVL mm	Weight gms	Number of Embryos	Embryo Length
13724	236	377	1	80
13778	248	402	2	45
13801	246	450	2	54

No females of any other species had enlarged ovarian or oviductal eggs.

DISCUSSION

Diets of the four most abundant species display an unusually high degree of myrmecophagy. This list of lizard species present at Eucla is no doubt incomplete (the uncommon gecko *Heteronotia binoei* and the large monitor *Varanus rosenbergi* would certainly be highly expected), yet this assemblage shows a fairly high species richness even without the spinifex grass tussocks and speciose *Ctenotus* skink fauna that characterizes red sandy desert habitats. In Table 7, the Eucla lizard assemblage is compared to two others, one a 15 species assemblage on a shrub desert study site at Lake Yeo, and another 16 species lizard assemblage at a pure spinifex desert area, the Neale Junction N-area (Pianka 1986). Ecological counterparts, some very approximate, are shown together on rows.

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